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CONTENTS

1	INTRODUCTION	4
1.1	PROJECT SCOPE	4
1.2	PURPOSE OF THE DOCUMENT	4
1.3	DOCUMENT VERSIONS SHEET	4
2	REFERENCE DOCUMENTS	5
2.1	REFERENCE DOCUMENTS	5
2.2	DEFINITIONS	5
2.3	ABBREVIATIONS	6
3	DOCUMENT OVERVIEW	7
3.1	EXECUTIVE SUMMARY	7
3.1.1	<i>Vision</i>	7
3.1.2	<i>System overview</i>	7
3.1.3	<i>Operational data</i>	8
3.2	SYSTEM DESIGN AND TECHNOLOGIES	9
3.3	DOCUMENT LOCATION IN PROJECT ACTIVITIES	9
4	OVERALL FUNCTIONAL DESIGN	10
4.1	ENVIRONMENTAL DATA	10
4.1.1	<i>Data objects</i>	10
4.1.2	<i>Geographical alerts</i>	10
4.1.3	<i>Translation</i>	11
4.2	OPERATIONAL DATA	11
4.3	MAIN ACTORS.....	12
4.3.1	<i>User</i>	12
4.3.2	<i>Provider</i>	12
4.3.3	<i>Translator</i>	12
4.3.4	<i>NS FRITS Agreement provider</i>	13
4.4	MAIN USE CASES.....	14
4.4.1	<i>Use case: create information entity</i>	15
4.4.2	<i>Use case: specify an NS FRITS Agreement</i>	15
4.4.3	<i>Use case: add parameter data</i>	15
4.4.4	<i>Use case: modify information entity</i>	15
4.4.5	<i>Use case: delete information entity</i>	15
4.4.6	<i>Use case: translate data object</i>	16

4.4.7 Use case: provide data via PULL/PUSH.....	16
4.4.8 Use case: set category preferences.....	16
4.4.9 Use case: set language preferences	17
4.4.10 Use case: search for point of interest	17
4.4.11 Use case: subscribing for information entity updates	17
4.4.12 Use case: viewing a file attached to an information entity	17
4.4.13 Use case: present information whilst driving.....	18
4.4.14 Use case: present information for routes or a specific location	18
4.4.15 Use case: driver generating a location based warning	18
4.4.16 Use case: provider generating a location based warning	19
4.4.17 Use case: user sets up NS FRITS Agreement	19
4.4.18 Use case: user signals deviation from NS FRITS Agreement	19
4.4.19 Use case: service provider signals deviation from NS FRITS Agreement	20
5 SYSTEM REQUIREMENTS.....	21
5.1 ENVIRONMENTAL DATA	21
5.1.1 Data collection.....	21
5.1.2 Data modelling/conversion.....	24
5.1.3 Analysis	24
5.1.4 Distribution	26
5.2 OPERATIONAL DATA / NS FRITS AGREEMENTS.....	26
5.3 CLIENT REFERENCE IMPLEMENTATION	27
5.3.1 Reference client requirements	27
5.3.2 Driver client requirements	28
5.4 OVERALL SYSTEM REQUIREMENTS	29
6 APPENDIX A: LIST OF FIGURES.....	30
7 APPENDIX B: LIST OF TABLES	31
APPENDIX C: LEGAL AND LICENSING ISSUES	32

1 INTRODUCTION

1.1 PROJECT SCOPE

The NS FRITS (North Sea Freight Intelligent Transport Solutions) project aims to improve efficiency and security in the North Sea region by introduction the concept of ITS (Intelligent Transport Solutions) in form of developing an information and communications system. The system will provide drivers, hauliers and freight forwarders information about traffic events, lorry specific road conditions, road weather, secure parking places and crime hotspots. It will also provide means for ferry operators, port operators and wholesalers to inform incoming trucks of delays or congestion.

The project will design and implement a trial system that will be evaluated by drivers and hauliers in the Netherlands, Germany and the UK during several pilot projects in 2010 and 2011. The NS FRITS project is scheduled to be completed in the end of 2011.

1.2 PURPOSE OF THE DOCUMENT

The purpose of this document is to provide system level requirements for the NS FRITS system. Prior to this document, the project carried out several surveys among the potential stakeholders of NS FRITS[2][3][4]. The surveys have been conducted in Sweden, The United Kingdom, Germany and The Netherlands, with drivers and operators all over Europe participating.

The results of those surveys as well as requirements added by the project partners were compiled in a user requirement document [1]. The user requirements have then been used as a basis for the system level requirements listed in this document.

1.3 DOCUMENT VERSIONS SHEET

Version	Date	Description, modifications, authors
1	2010-03-11	First draft distributed outside Volvo, Claes Pihl
2	2010-07-18	Updated still incomplete version, Claes Pihl, Carl Jonsson
3	2010-10-25	Completed missing parts of the document, added Images and Text, Carl Jonsson
4	2010-11-03	Document finalised for submission, Carl Jonsson
5	2010-11-23	Document update, completion and proofreading by (Avanti)

Table 1-1 : Document versions sheet

2 REFERENCE DOCUMENTS

2.1 REFERENCE DOCUMENTS

- [1] NSFRITS AVA_REQ_0001_User_Requirements_IssueH
- [2] NSFRITS – Transport Operator Survey Data Analysis
- [3] NSFRITS - Driver Survey Data Analysis 160810
- [4] The TLN Approach to Transport Security

2.2 DEFINITIONS

Name	Description
Data object	A piece of information that is associated with an information entity. It could contain text, sound files, documents (e.g. a PDF-file) or links to web-pages or external applications. A single data object can be available in different version for different languages.
Information category	Each information entity belongs to a certain information category; This allows for information classification such that users can receive only information that they are interested in. Examples of information categories are: Traffic information, Lorry specific road conditions, Crime hotspots and Secure parking.
Information entity	An information entity in its simplest form contains a category, a position, a geographic boundary and a validity period. It is also possible to add any number of data objects to it, and to associate it with an NS FRITS agreement service.
Independent data provider	An independent data provider is an organisation (company or public authority) that is used as a data source for the NS FRITS system. In contrast to NS FRITS data providers, which use NS FRITS to create and host their data, independent data providers have their own system for making information available.
NS FRITS data provider	An NS FRITS data provider is an organisation (company or public authority) that provide data to the NS FRITS system. An NS FRITS data provider will use NS FRITS tools to create information for provision to users.
NS FRITS agreement	An NS FRITS agreement is an agreement between a user (driver) and an agreement provider about an event that should occur at an agreed time. The user (driver) and the agreement provider use the NS FRITS agreement to inform each other about any deviations from the original agreement.
NS FRITS agreement service	A service (or connection point) that the user connects to for creating an NS FRITS agreements.

Table 2-1 Definitions

2.3 ABBREVIATIONS

Name	Description
NS FRITS	North Sea Freight Intelligent Transport Solutions
ITS	Intelligent Transport System/Solution
GPRS	General Packet Radio Service
POI	Point of Interest
3G	Third Generation of mobile telecommunication services
WiFi	Wireless Fidelity, certification trademark for WLAN (Wireless Local Area Network) devices
XML	Extensible Markup Language
HMI	Human Machine Interface

3 DOCUMENT OVERVIEW

3.1 EXECUTIVE SUMMARY

The section is aimed to give a brief understanding of the goals of NS FRITS on a system level. It will describe the different components that constitute the NS FRITS system and their respective purposes.

3.1.1 Vision

North Sea Freight Intelligent Transport Solutions is set to dramatically improve accessibility to live information for the road freight sector in the seven countries of the North Sea Region and ultimately, throughout the entire Europe. Improved access to live information will enhance safety, security and efficiency, in part by reducing the risk of accidents and security threats for drivers of heavy goods vehicles.

The three main objectives of the project are to:

- Develop an electronic communications system in a number of languages for road freight drivers and transport managers within the North Sea Region.
- Provide live in-cab communications to drivers about conditions in the region or country they are approaching.
- Inform transport managers and freight handlers as their drivers and loads move around the North Sea Region.

The North Sea Region includes Denmark, Sweden, Norway, the United Kingdom, Germany, Belgium and the Netherlands.

3.1.2 System overview

The NS FRITS system will handle two main types of data, environmental data and operational data. Environmental data, which is also known as location based data, refers to public data bound to a geographical location. Operational data on the other hand, refers to private data between two parties, e.g. a driver and a port operator.

3.1.2.1 Environmental data

The part of NS FRITS related to environmental data will consist of three main components: Data providers, the NS FRITS server, and NS FRITS users. This section will give an overview of each component and their respective role in the NS FRITS system. It will also describe how the data will be gathered, analyzed and distributed by the system.

3.1.2.2 Data providers

A data provider is an organization or a service providing data to the NS FRITS system. It could for example be the Swedish Customs providing rules, documents and general information about customs procedures in Sweden, or the road administration service in the UK providing up to date information about road conditions, road works, and weather information.

NS FRITS will support text data, images, sound files and documents (e.g. PDF-forms), each available in multiple languages. All data in NS FRITS can be georeferenced.

3.1.2.3 NS FRITS database and server

All information gathered from data providers will be stored in a database, together with details about its geographical position. The NS FRITS server's main role is then to serve NS FRITS users with data from this database. To decide what data each user might be interested in, the server keeps certain information about each user. Such information includes language preference(s), current destination, and which data categories the user is interested in. The users can then require information from the NS FRITS server by using several functions. For example a user can tell the NS FRITS server a route and it will respond with all relevant data along that route. Users can also use NS FRITS to search for a particular point of interest, e.g., the closest secure parking place, or what police uniforms look like in Germany.

3.1.2.4 NS FRITS users

There are two main types of users of the NS FRITS system, mobile users and stationary users:

Mobile users are typically truck drivers and connect to the NS FRITS system by either using an in-vehicle computer or a smartphone application. Each device is connected to a GPS unit and uses GPRS or 3G for communication. The interface provided to the mobile user allows for seeing nearby POIs (Point of Interest) on a map, searching for information in the NS FRITS system or simply drive around and get information when a relevant information entity is approached.

Stationary users instead access NS FRITS from a desktop computer. They can for example be a truck driver that is using NS FRITS in an internet cafe at a truck stop, or at home. It could also be a dispatcher or transport manager using NS FRITS to aid them with route planning, making sure their trucks have access to secure parking places, avoiding crime hotspots, avoiding routes with road works, etc.

3.1.2.5 Information gathering

How information is gathered is a crucial part of the NS FRITS system. There are two main ways of inserting data in the NS FRITS system.

In the first way, NS FRITS will gather data from existing data sources and convert it into the format distributed by NS FRITS. This approach will make NS FRITS easy to integrate with current providers, since no changes to existing systems have to be made. An example of this type of information gathering is road and traffic information published in the EU standard DATEX II.



Figure 3.1 Illustrates how data from existing(independent) providers are inserted into the NS FRITS database

The second way of gathering data will be data insertion directly into NS FRITS format. This will make it possible for transport related actors to provide data to drivers without building their own information system. This mechanism could for example be used by a ferry terminal or a customs station that would like to give information and instructions to approaching drivers.

3.1.2.6 Geographical alerts

Another feature in the NS FRITS system is that it also functions as a location based alert system. As an optional add-on to the core functionality of NS FRITS, drivers can choose to periodically send updates of their current position to NS FRITS. By doing this, drivers will receive instant alerts of accidents, police warnings or emergencies near them. NS FRITS will support two different types of alerts:

Provider alerts, meaning alerts coming from outside NS FRITS like for example a police station or a local authority and User generated alerts, which are alerts generated by users of the NS FRITS system. When an alert enters the NS FRITS system it will automatically be forwarded to all drivers in the vicinity of the alert's origin.

3.1.2.7 Distribution and analysis

The distribution of data itself will be handled in two ways, either by requests from the user's client or by the server pushing out information to each user. Since the NS FRITS server knows what language(s) each user prefers and what type of information the user is interested in, it can reduce the data traffic by only selecting information relevant to the user.

3.1.3 Operational data

In addition to the location based data, or environmental data, described above, NS FRITS will also provide a mechanism for lorries and operators to exchange operational data. An operational data exchange will unlike environmental data only exist between two specific parties, e.g. a lorry driver and a ferry operator. In NS FRITS, this functionality is called NS FRITS Agreements.

NS FRITS will provide a mechanism that allows drivers to set up NS FRITS Agreements with goods terminals, ferry terminals, and other actors that they interact with. If a driver has a business agreement with a container terminal about picking up a container at a certain time, it can in addition to the business agreement, create an NS FRITS Agreement that purely states that a service will be performed between the two parties at the specified time. Both parties can then use the NS FRITS Agreement service to inform each other about any expected deviation from the business agreement.

For example, if a container ship has problems docking, the port terminal operator might inform all lorries that are waiting for cargo from that ship, of the delay. By doing this the operator avoids unnecessary congestion in the port area.

Another example of using NS FRITS Agreements could be the truck sending its exact arrival time to the port operator. This allows for the port operator to prepare the cargo just in time for the truck's arrival, leading to a smooth pickup - a motivating factor for all concerned.

3.2 SYSTEM DESIGN AND TECHNOLOGIES

During the system design phase of NS FRITS, appropriate tools and technologies will be selected to satisfy the requirements listed in this document. To minimize development effort, the project will make use of COTS (Commercial of the shelf) products - both software and hardware – whenever it is more cost effective to do so.

The details regarding the system design will be explained more thoroughly in the system design document.

3.3 DOCUMENT LOCATION IN PROJECT ACTIVITIES

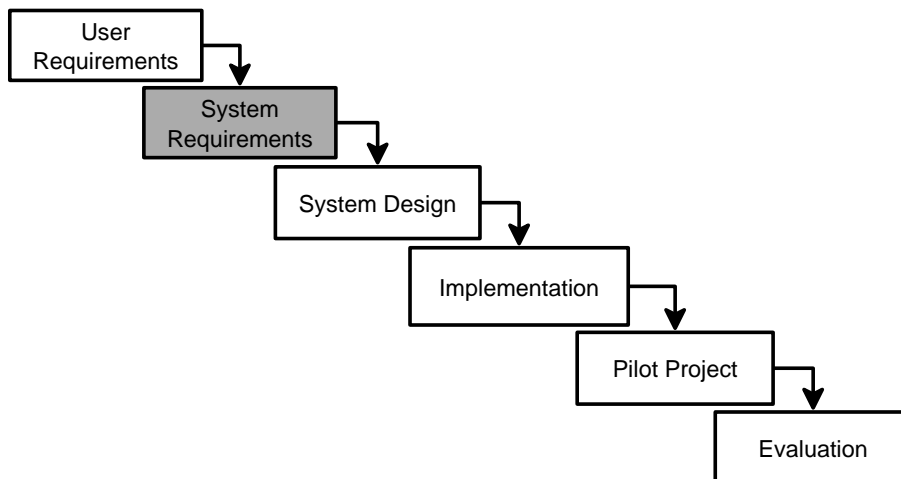


Figure 3.2 Shows the location of this document in context of the entire project

4 OVERALL FUNCTIONAL DESIGN

Two main types of data will be considered in the NS FRITS system, environmental data and operational data. From a functional point of view, NS FRITS will provide services belonging to both of these data types.

4.1 ENVIRONMENTAL DATA

Environmental data, also known as location based information, is a general data type that is bound to a certain geographical area. This data is published by data providers with the purpose of reaching out to all the users of the NS FRITS system. Each unit of data published is called an Information Entity. To allow users to filter out the information they are interested in, all information entities belong to a data category, for example Crime Hotspots, Secure Parking, Traffic Information, Customs Information and Lorry Specific Road Conditions. Furthermore, NS FRITS will also provide the possibility to filter out data based on geographical parameters with contextual awareness/relevance to the user's geographical location. .

4.1.1 Data objects

To be able to display data in a simple and organized way, Information Entities will be split up into several independent nodes called Data Objects. An Information Entity will then contain multiple Data Objects, each linking to other Data Objects in a tree like fashion (See Figure 4.1). The reason for splitting up data in this way is to make it possible for the user/driver to only select information that is of interest to them.

For instance, a customs border station uses NS FRITS to publish information about customs procedures, vehicle forms, driving instructions and vehicle regulations. When they enter this data into NS FRITS, they put the information from each of those information categories into separate Data Objects, i.e. one Data Object containing driving instructions, another Data Object containing vehicle restrictions, etc.

They then create one main Data Object containing a general overview of the Information Entity, i.e. "Welcome to the customs station in X, here you can view more information about customs procedures, driving instructions.....". Finally they set up links between the main Data Object and the Data Objects reflecting each information category.

When a user then looks this Information Entity up through NS FRITS, it is first presented with the main Data Object described above. From there on he can select specifically what type of information he is interested in, and thus is not overwhelmed with irrelevant information.

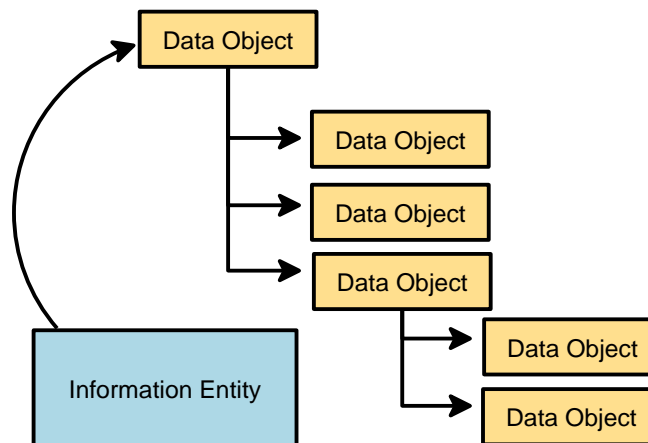


Figure 4.1 Show the relationship between Information Entities and Data Objects, the Data Objects contain the actual information in the system.

4.1.2 Geographical alerts

The NS FRITS system will also support geographical alerts, which is another type of environmental data. Alerts can either be user generated by the drivers using the system, or forwarded as a Provider Alert by a police station or another authority acting as an NS FRITS data provider. The difference between an alert and regular data published by a data provider is that alerts are immediately pushed out to all users in the vicinity of the alert's geographical relevance.

4.1.3 Translation

One of the original requirements of the system was multilingualism; therefore translation has a large role in the system. Often data providers only publish information in one or perhaps two different languages, this can cause problems for foreign drivers on a temporary visit. Since it is not feasible to assume that all data providers by themselves will translate their information into all languages spoken in the North Sea Region, NS FRITS will support data translation internally.

NS FRITS will implement two different ways of data translation, manual and computer aided. Each method has its own use depending on the requirements of the data provider or the impact of the data itself. Non-critical and volatile information such as road weather can preferably be translated by a computer, since minor translation errors do not have any critical impact on the driver. Besides, it would be to time and cost consuming to perform a manual translation for this type of data.

However, information that has a legal status, such as national traffic rules or customs regulations, needs to be carefully translated by a professional to avoid ambiguity. It is also very likely that they would also like to perform the translation themselves, as they need to have full control of the content.

To deal with manual translations, NS FRITS will introduce a web based interface that employed translators can use to translate information entities recently published by data providers. NS FRITS will also support to possibility for data providers to publish their information in multiple languages, in case they want to handle all translations internally.

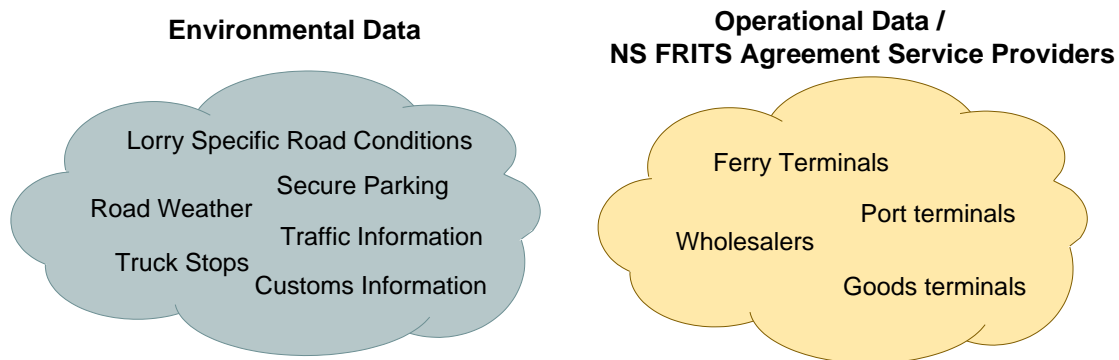


Figure 4.2 Environmental Data and Operational Data

4.2 OPERATIONAL DATA

Unlike environmental data, operational data is confidential between two parties and is therefore not openly published by a provider. For two parties to be able to start exchanging operational data, both parties first have to setup a communication channel. NS FRITS will provide the mechanism to help both parties to setup this communication channel, which is called an NS FRITS Agreement.

An NS FRITS Agreement is setup on top of a business agreement and does not contain any business related data itself, only a reference to the original business agreement. The idea of setting up an NS FRITS Agreement is to give both parties the possibility of informing each other of deviations from the original business agreement.

For example: A driver receives an order to pick up a load of fish from a fishing harbour and to deliver it to a fish wholesaler. The driver - or his haulier/freight forwarder - sets up two business agreements, one with the fishing harbour to pick up the fish at a certain time and another with the fish wholesaler to deliver the fish at another time. On top of the two business agreements, two NS FRITS Agreements are also created using a reference to both business agreements. The creation process of the NS FRITS Agreement could be done in different ways: In conjunction with the creation of the business agreement, or by manually setting it up afterwards using the NS FRITS device.

If an NS FRITS Agreement is setup between the driver and the fishing harbour, the fishing harbour can inform the driver in case of delays at the harbour. The driver can also inform the fishing harbour if he will be arriving later or earlier than the originally specified time. By also setting up an NS FRITS Agreement with the

fish wholesaler, the driver can inform the wholesaler exactly which minute he will arrive to ensure a just in time delivery.

In a real life situation, the driver will not have to manually send updates to all agreement parties. Instead, the driver's navigational system will handle it for him.

Since operational data consists of business sensitive information, it is never stored or logged inside the NS FRITS system. NS FRITS merely provides a mechanism for the parties involved in an agreement to communicate with one another..

4.3 MAIN ACTORS

This section will define the main actors of the NS FRITS system, what role they will have and how they use NS FRITS to interact with each other.

4.3.1 User

The user is a person that uses NS FRITS as a tool for planning and streamlining the transportation of goods. A user could either be mobile (typically a driver) or stationary (typically a dispatcher or a driver using NS FRITS outside the lorry). Some services will only be available for mobile users, and some for all kind of users. The term User will be used for statements that are valid for both mobile and stationary users.

4.3.1.1 Driver (mobile user)

The driver is a person using NS FRITS from inside a lorry through a terminal, vehicle-mounted or hand-held.

4.3.1.2 Stationary user (dispatcher or driver)

The stationary user is a person using NS FRITS on a stationary computer. It could be a dispatcher that is using NS FRITS at the office, or it could be a driver that gets access to NS FRITS at a stationary computer during a break or at home before a journey.

4.3.2 Provider

A provider is an entity or a company providing data to the NS FRITS system. There are two types of data providers in NS FRITS, Independent data providers and NS FRITS data providers.

4.3.2.1 Independent data provider

An independent data provider is an existing data source that provides data to NS FRITS. An independent data provider could be a national road authority providing traffic information, a police organisation providing crime statistics for different areas or road segments etc. The independent data provider is not part of the NS FRITS system, so NS FRITS has to adapt to already existing content, data format and protocols.

4.3.2.2 NS FRITS data provider

An NS FRITS data provider is using an NS FRITS interface to make data available for the users. This data will be held by the NS FRITS system and it will be inserted directly into the NS FRITS system. An NS FRITS data provider will likely be a small data provider, like a Customs station or a ferry terminal that does not have its own data providing systems, like the national road authorities have.

4.3.3 Translator

A Translator is a person or a system that translates information between different languages. To translate spoken voice messages, there is also a need to read and record the messages in different languages. To simplify the model, we say that the translator takes care of both translation and reading of the information.

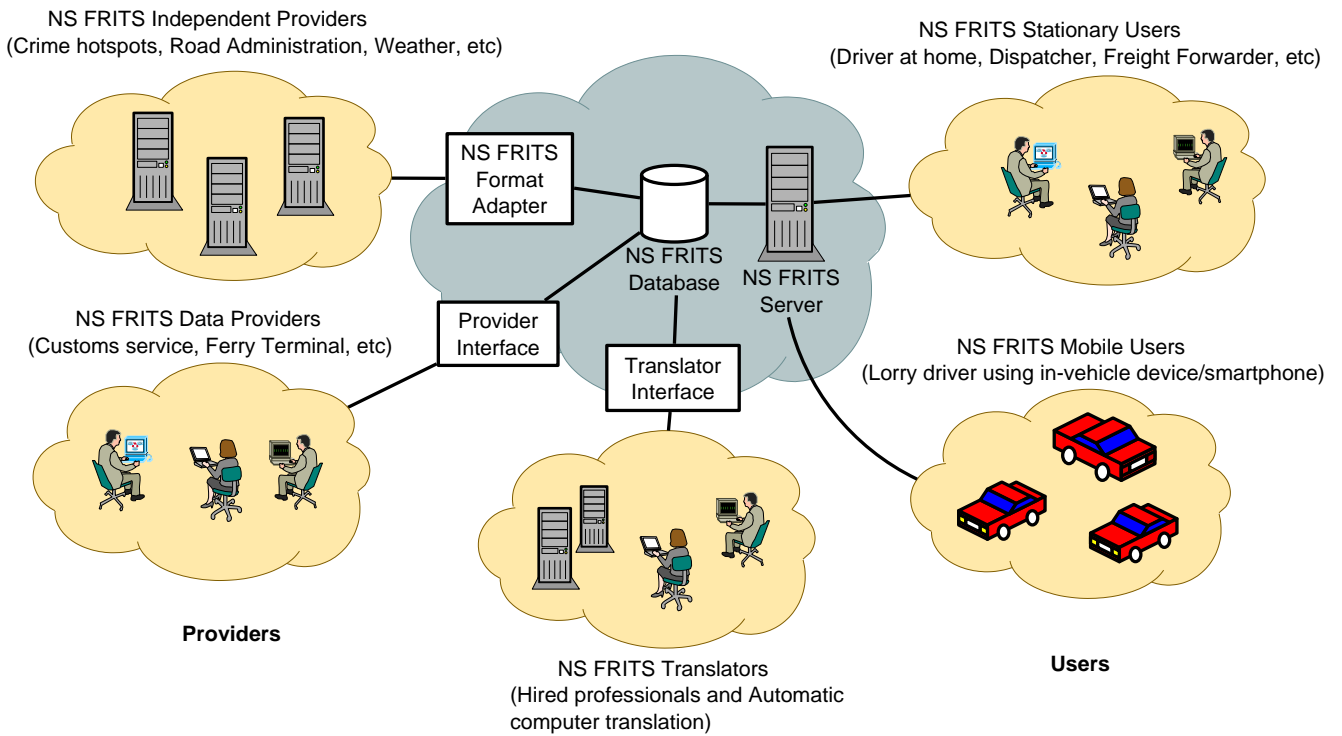


Figure 4.3 Shows how Users, Translators and Providers interact with the NS FRITS system. Providers are shown at the left side, Users at the right side and Translators in the middle.

4.3.4 NS FRITS Agreement provider

An NS FRITS Agreement provider is an organisation (company or public authority) that has set up one or more NS FRITS Agreement services. An NS FRITS Agreement provider could e.g. be a ferry terminal, a customs station or a goods terminal.

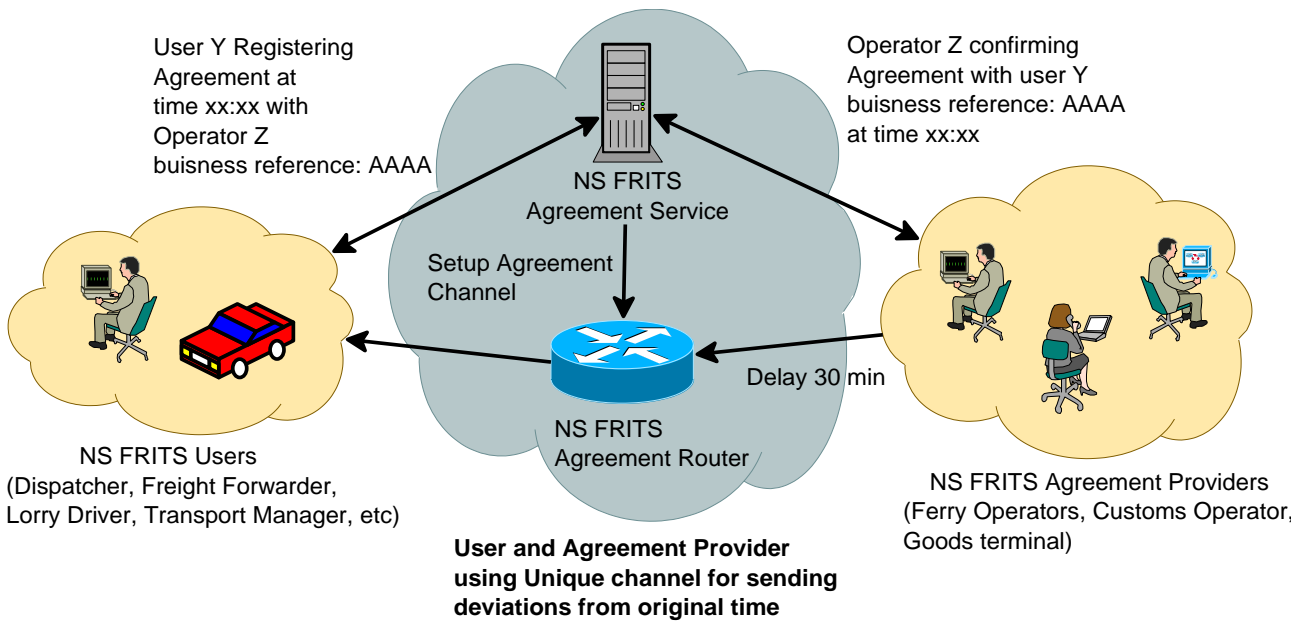


Figure 4.4 Overview how the NS FRITS Agreement service is being used for transferring operational data between users and providers.

4.4 MAIN USE CASES

This section will define the main uses cases identified for the NS FRITS system. Each use case refers to the particular requirement it fulfils, in the form Req-XX-Y. All requirements are listed in Section 5, System Requirements.

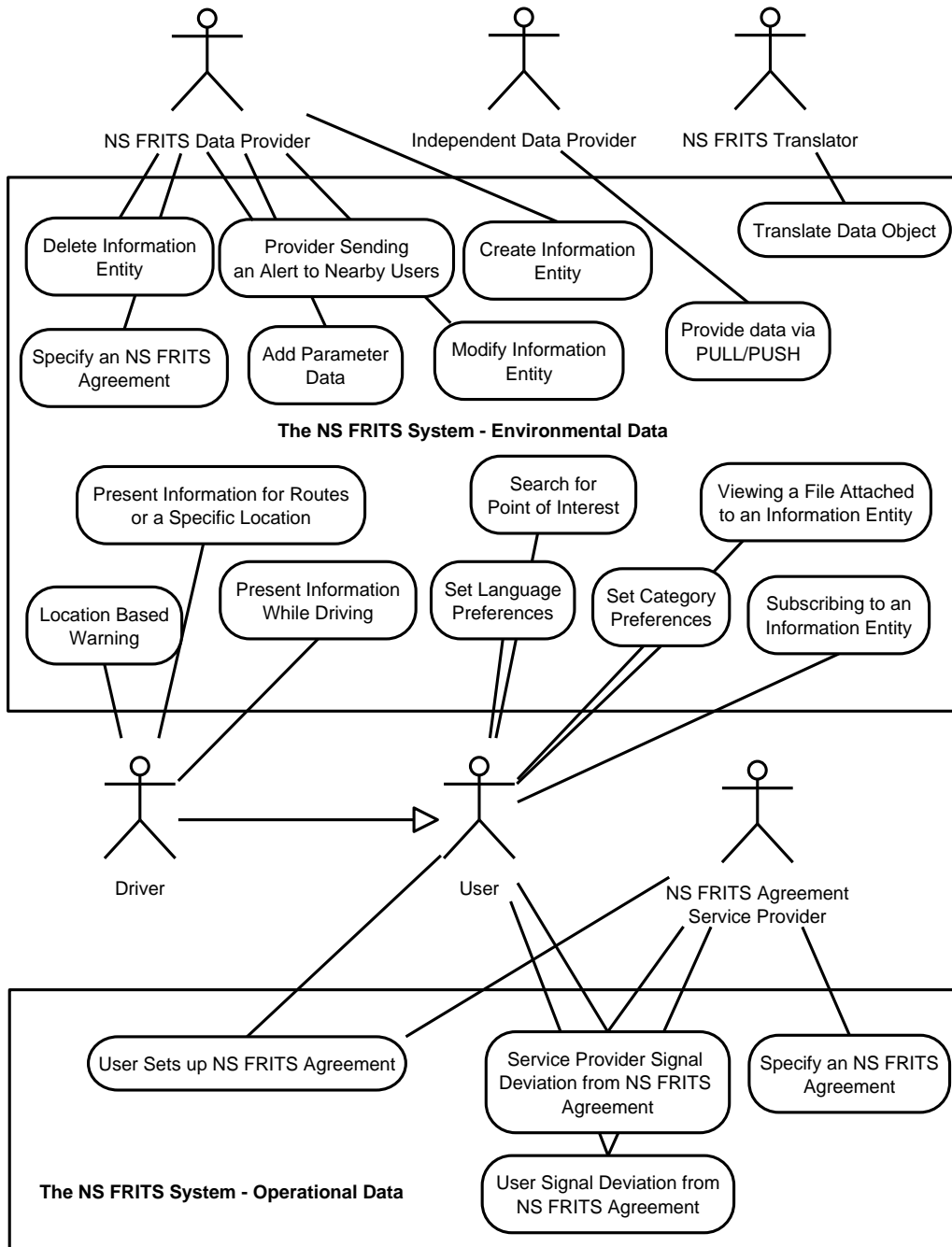


Figure 4.5 Actors and use cases of NS FRITS

4.4.1 Use case: create information entity

The purpose of this use case is to make it possible for an NS FRITS data provider to create an information entity.

1. The NS FRITS data provider creates a new information entity.
Req-DC-5
2. The NS FRITS data provider specifies a category and an icon for the information entity.
Req-DC-8
3. The NS FRITS data provider specifies a validity period for the information.
Req-DC-10
4. The NS FRITS data provider decides which languages the information shall be available in. It also decides if the information shall be automatically translated or manually translated by an NS FRITS Translator.
Req-DC-13, Req-DM-8
5. The NS FRITS data provider specifies a geographical boundary where the information shall be valid.
Req-DC-7
6. The NS FRITS data provider attaches data objects to the information entity and organises them in a hierarchy.
Req-DC-12, Req-DC-14, Req-DC-15

4.4.2 Use case: specify an NS FRITS Agreement

The purpose of this use case is to make it possible for an NS FRITS data provider to specify an NS FRITS agreement to an information entity.

1. The NS FRITS data provider optionally specifies an NS FRITS Agreements service that shall be associated with the information entity.
Req-DC-11

4.4.3 Use case: add parameter data

The purpose of this use case is to make it possible for an NS FRITS data provider to add parameter data (e.g. maximum weight allowed, free parking spots, temperature, speed limit, etc) to an information entity.

1. The NS FRITS data provider specifies a parameter type and a parameter value that should be associated with the information entity.
Req-DC-9

4.4.4 Use case: modify information entity

The purpose of this use case is to make it possible for an NS FRITS data provider to modify an information entity.

1. The NS FRITS data provider modifies an information entity.
Req-DC-16, Req-DC-18

4.4.5 Use case: delete information entity

The purpose of this use case is to make it possible for an NS FRITS data provider to delete an information entity.

1. The NS FRITS data provider deletes an information entity
Req-DC-17, Req-DC-18

4.4.6 Use case: translate data object

The purpose of this use case is to make it possible for a Translator to translate data objects from one language to another.

Pre conditions: An NS FRITS data provider has created one or more data entities where the data objects are not available in all the different languages they are specified to be available in. The data provider also needs to specify that the object should be translated by an NS FRITS Translator and not by a computer.

1. The Translator searches for available and feasible information entities to translate.
Req-DM-3
2. The system present information entities that needs to be translated.
Req-DM-2
3. The Translator selects the information entity that he/she would like to translate, and locks it so other translators are prohibited from working on it.
Req-DM-4, Req-DM-5
4. The Translator performs the translation
5. The Translator enters the translated information into the data entity
Req-DM-7
6. The translated information is now ready to be presented to users.

Note: In a reality this use case will probably be a lot more complex, as there will be a cost for translating the data, and the data provider may need to get an offer before the translation take place. There could also be a need for the provider to review the data before it will be available for the users.

4.4.7 Use case: provide data via PULL/PUSH

The purpose of this use case is to make it possible for an independent provider to provide data to the NS FRITS system.

1. A Connection between the independent provider and NS FRITS is created, either by a PUSH subscription or a PULL service.
Req-DC-1
2. Whenever data is made available by the independent provider, it is transferred to an NS FRITS format adapter (PULL or PUSH) and converted to the internal NS FRITS format.
Req-DC-2
3. The new data is stored in the NS FRITS database.
Req-DC-4

4.4.8 Use case: set category preferences

The purpose of this use case is to let users decide what information categories to receive information about. Only information entities from those categories will then be presented to them..

1. The system fetches the available categories.
2. The user selects the categories he is interested in.
Req-AN-2
3. The system saves the preferences.

4.4.9 Use case: set language preferences

The purpose of this use case is to let the user decide what languages he prefers the information to be presented in.

1. The user specifies a prioritised list of languages in which information shall be received, e.g. first Swedish, then English, then German.

Req-AN-2

4.4.10 Use case: search for point of interest

The purpose of this use case is to allow a user to search for information entities from a specified category.

1. The user specifies what category of information entities to search for, e.g. safe parking places or customs stations.

Req-AN-6

2. The user defines where to search (set a geographic boundary).
The default alternative will likely be around the position where the lorry is located, or along the road where it is currently travelling.

3. The system searches for data entities that match the search criteria

Req-AN-6

4. The result is presented to the user

Req-AN-6, Req-RC-1

5. The user selects an information entity and gets a presentation of the data objects associated with it.

Req-RC-7, Req-RC-13,

4.4.11 Use case: subscribing for information entity updates

The purpose of this use case is to allow a user to subscribe to updates from an Information Entity. When a user has subscribed to an information entity, they automatically receive updates whenever the information entity is updated by its respective data provider.

1. The user selects an information entity of interest, either by searching for it or by receiving a notification of it while driving.

Req-RC-8, Req-RC-1

2. The user decides to subscribe for the information entity to be able to receive immediate updates whenever the object changes.

Req-AN-8

3. The content of the information entity is updated by its data provider.

Req-DC-16

4. The system sends the updated information to all users subscribed to that particular information entity.

Req-DB-5

4.4.12 Use case: viewing a file attached to an information entity

The purpose of this use case is to allow a user to search for information entities from a specified category.

1. The user selects an information entity of interest, either by searching for it or by receiving a notification of it while driving.

Req-RC-1, Req-DR-4

2. The system presents all files attached to the particular information entity.
Req-RC-7
3. The user selects one of the attached file and decides to download it
Req-RC-14
4. The attached file is presented to the user either from within the NS FRITS application or by using an external application, depending on the file type.
Req-RC-15, Req-RC-16, Req-RC-17

4.4.13 Use case: present information whilst driving

The purpose of this use case is to give a driver relevant information about the area where he is currently driving

1. The system get the current position of the vehicle
Req-AN-4
2. The system find all relevant information entities in an area around the current vehicle position
Req-AN-1, Req-AN-3
3. The system presents the relevant information entities to the driver. Those first three steps will be repeated until the driver selects an information entity.
Req-RC-1
4. The driver selects an information entity and receives data objects associated with it. This use case will then start again from point one.
Req-DR-3, Req-RC-13

4.4.14 Use case: present information for routes or a specific location

The purpose of this use case is to give the user relevant information connected to a planned route or a location other than the current position of the vehicle

1. The user specifies a route or a location and request relevant information along the route or close to the location.
Req-RC-9
2. The system collects relevant information entities along the route
Req-AN-1
3. The system presents the relevant information entities to the user
Req-RC-1
4. The user selects an information entity and receives Data objects associated with it
Req-RC-2, Req-RC-13

4.4.15 Use case: driver generating a location based warning

Purpose: The purpose of this use case is to make it possible for a driver to inform other drivers in the same area about an emergency situation.

Description: In case of an emergency situation a driver, or an automatic sensor, can send a warning to the NS FRITS system. This warning will generate an information entity so that vehicles close to this location can receive a warning – a virtual warning triangle will be placed around the accident.

1. The driver is involved in an emergency situation (or a situation with a high risk for an emergency to occur).
2. The driver (or an automatic crash detector) generates a warning.

Req-DC-19

3. The system sends out information to all drivers close to the emergency situation that have requested this category of information.

Req-AN-1, Req-AN-3

4. Drivers in vehicles close to the emergency receive a warning about the emergency situation.

Req-RC-1

4.4.16 Use case: provider generating a location based warning

Purpose: The purpose of this use case is to allow a provider to send an immediate alert to all lorry drivers near the location of the alert.

Description: In case of an alarm or an emergency, a provider can use the NS FRITS system to create an alert at the target location. This alert will be immediately forwarded by the NS FRITS system to all trucks nearby to the alert location.

1. A provider receives an alarm at a target location (Road Accident, Crime, Disaster, etc)
2. The provider uses NS FRITS to create an alert at the target location.

Req-DC-6

3. The system sends out information to all drivers close to the emergency situation that have requested this category of information.

Req-AN-1, Req-AN-3

4. The drivers in vehicles close to the emergency situation receive a warning about the emergency situation.

Req-RC-1

4.4.17 Use case: user sets up NS FRITS Agreement

The Purpose of this scenario is to make it possible for a user to set up an agreement with an NS FRITS agreement provider. The agreement will then be used to keep the two parties notified of deviations to the business agreement.

1. The user selects an NS FRITS agreement service. This could be done by choosing an information entity with an NS FRITS agreements service associated to it.

Req-RC-10

2. The user request a new NS FRITS agreement

Req-AG-1

3. The NS FRITS agreement provider accepts the NS FRITS agreement

Req-AG-2

4.4.18 Use case: user signals deviation from NS FRITS Agreement

The purpose of this scenario is to make it possible for a user to inform the NS FRITS agreement provider about an expected deviation.

1. The user or its navigational system realizes that he will not be able to perform a service (e.g. deliver goods, or arrive at a ferry terminal) at the agreed time.
2. The user/system updates the agreement with a new expected time (this does not have to be done manually; it can be performed in the background by the users NS FRITS client.)

Req-AG-3

3. The NS FRITS agreement provider receives information about the expected deviation

Req-AG-4

4. The NS FRITS Agreement provider reacts to the information, e.g. by contacting the user.
Note: How to react on the information is solely up the users of the agreement service.

4.4.19 Use case: service provider signals deviation from NS FRITS Agreement

The purpose of this scenario is to make it possible for an NS FRITS agreement provider to inform driver(s) with agreement(s) about expected deviation.

1. The NS FRITS agreement provider (e.g. a ferry terminal) realises that it will not fulfil prior agreement (s) (e.g. a ferry is expected to be one hour late.)
2. The NS FRITS agreement provider updates all concerned agreement with the new expected time, (i.e. all lorries that are heading for this ferry, and have created an agreement concerning this specific departure).

Req-AG-3

3. The NS FRITS agreement provider sends out a text message with information about the deviation, i.e. reason for the deviation (ferry delayed because of storm) or instructions (check in will open at normal time, even though the ferry is delayed.)
4. The drivers receive information about the expected deviation.

Req-AG-4

5. The driver's provider reacts on the information. How this is done solely up the user of the agreement service.

5 SYSTEM REQUIREMENTS

5.1 ENVIRONMENTAL DATA

This section describes the requirements the system has related to environmental data or location based data. The section will be split into four different subsections, data collection, data modelling/conversion, analysis and distribution.

Data collection refers to how data shall be gathered into the system and what type of data that shall be gathered.

Data modelling/conversion describe how data will be modelled and stored into the system.

Analysis refers to how data shall be analysed depending on what parameters the users set up.

Distribution describes how data shall be distributed between the server and the users of the system.

5.1.1 Data collection

ID	Description	Type	Priority
Req-DC-1	<p>The system shall be able to connect to independent data providers via PULL/PUSH techniques.</p> <p>Description: PULL techniques involve the NS FRITS system periodically fetching data from the data provider, checking every few minutes or so if the provider has any new data.</p> <p>PUSH techniques involve NS FRITS setting up subscription(s) with the data provider. Whenever the provider creates a new data entity, it is then automatically sent to the NS FRITS server as part of the data subscription.</p>	F	E
Req-DC-2	<p>The system shall be able to extract data from an independent data provider and convert it into a format that is compliant with data provided by an NS FRITS data provider (the NS FRITS internal data format).</p>	F	E
Req-DC-3	<p>The system shall be able to keep references to the original data sources and fetch data when it is requested.</p> <p>Information: The NS FRITS system shall not have to keep replicas of all data available in all its independent data sources. So for heavy data, like large documents and pictures, it shall be possible just to keep a reference and fetch the data when requested by a user.</p> <p>Used by: Use case: viewing a file attached to an information entity</p>	F	E
Req-DC-4	<p>The system shall be able to store information entities.</p> <p>The following elements are mandatory for each information entity:</p> <ul style="list-style-type: none"> • A position defining the geographical location of the physical object/event that the information entity is representing. • A category (e.g. traffic, crime or weather information) • A type (e.g. road construction area, criminal hotspot, or snow storm) • A validity period • A geographic boundary that define where the information shall be presented to the drivers. <p>It shall also be possible to add the following to an information entity:</p>	F	E

	<ul style="list-style-type: none"> Any number of data objects organized in tree structure An association to an NS FRITS Agreements services <p>Used by: Use case: create information entity</p>		
Req-DC-5	<p>An NS FRITS data provider shall be able to create information entities.</p> <p>Used by: Use case: create information entity</p>	F	E
Req-DC-6	<p>An NS FRITS provider should be able to create a location based alert. An alert should automatically be forwarded to all NS FRITS users in a certain radius of the alert.</p>	F	D
Req-DC-7	<p>An NS FRITS data provider shall be able to set the geographic boundary for an information entity.</p> <ul style="list-style-type: none"> It shall be possible to express the boundary as a circle (a centre point and a radius) As a number of points that when connected with lines creates a closed geographic area. As a road segment? As a country? <p>Description: The geographic boundary shall define in what area the information is relevant. The information will be presented to a driver when the driver enters this area.</p> <p>Used by: Use case: create information entity</p>	F	E
Req-DC-8	<p>An NS FRITS data provider shall be able to set an icon and category for an information entity.</p> <p>Description: The icon specifies a string value so the client knows what icon should be used when the information entity is displayed on a map. Road construction area, crime hotspot, or snow storm are examples of categories.</p> <p>Used by: Use case: create information entity</p>	F	D
Req-DC-9	<p>An NS FRITS data provider shall be able to add a parameter to an information entity.</p> <p>Description: Parameters are used to give language independent data to users of the system; each parameter consists of a parameter type and a value. The parameter type can for example be: Free parking spots, local temperature, maximal allowed weight or speed limit.</p>	F	D
Req-DC-10	<p>An NS FRITS data provider shall be able to set the validity period for an information entity.</p> <p>Used by: Use case: create information entity</p>	F	E
Req-DC-11	<p>An NS FRITS data provider shall be able to associate an NS FRITS agreements service with an information entity.</p> <p>Used by: Use case: create information entity</p>	F	E
Req-DC-12	<p>An NS FRITS data provider shall be able to attach the following type of data objects to an information entity:</p> <ul style="list-style-type: none"> Text messages 	F	D

	<ul style="list-style-type: none"> • PDF files • Links to external web pages • Sound files • Images <p>Used by: Use case: create information entity</p>		
Req-DC-13	<p>An NS FRITS data provider shall be able to specify in which languages a data object shall be available.</p> <p>Description: The required languages will make it possible for the NS FRITS system to identify when there are data objects that needs to be translated. It shall be possible to set this individually for each data object.</p> <p>Used by: Use case: create information entity</p>	F	E
Req-DC-14	<p>The NS FRITS data provider shall, for each data object, be able to specify in what language (or languages) it is provided in.</p> <p>It shall be possible to set more than one (many) language to a data object, a specific version of document could e.g. be in three different languages.</p> <p>It shall be possible to specify a data object as language independent and therefore valid for all languages. This could e.g. be the case for pictures and icons.</p> <p>Used by: Use case: create information entity</p>	F	E
Req-DC-15	<p>An NS FRITS data provider shall be able to organize data objects in a hierarchical way, so that it is possible to create a hierarchical menu structure of the information when it is presented.</p> <p>Used by: Use case: create information entity</p>	F	E
Req-DC-16	<p>An NS FRITS data provider shall be able to modify the content (data objects) of an information entity in the following ways:</p> <ul style="list-style-type: none"> • Add or remove data objects • Modify data objects • Change category, type, validity period, or geographic boundary. <p>Used by: Use case: subscribing for information entity</p>	F	E
Req-DC-17	<p>An NS FRITS data provider shall be able to delete an information entity</p> <p>Used by: Use case: delete information entity</p>	F	E
Req-DC-18	<p>Only the owner of a data entity shall be able to modify or delete a data entity.</p> <p>Used by: Use case: delete information entity</p>	F	E
Req-DC-19	<p>A driver shall be able to create a warning information entity at the current position of the vehicle.</p> <p>Information: This information could be used to send out warning messages to other drivers in the nearby area.</p> <p>Used by: Use case: driver generating a location based warning</p>	F	D

Req-DC-20	If an existing information object is updated, the NS-FRITS system shall send out updates to all users subscribed to that object.	F	D
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Table 5-1 Data collection requirements.

5.1.2 Data modelling/conversion

ID	Description	Type	Priority
Req-DM-1	The system shall be able to parse XML data in the DATEX II format.	F	E
Req-DM-2	A Translator shall be able to search for information entities that need to be translated, i.e. information entities with data objects that are not available in all the different languages specified by the NS FRITS data provider. Used by: Use case: translate data object	F	E
Req-DM-3	A Translator shall be able to define, category and languages as search criteria when searching for entities that need to be translated. Description. All Translators may not be capable of translating all kind of data. Both knowledge of language and the technical area may be required. Used by: Use case: translate data object	F	D
Req-DM-4	A Translator shall be able to lock an information entity during the translation so that not more than one Translator can work on the same information entity. Information: As translating complex information can be a time consuming process, it could be a risk that more than one Translator start to translate the same information entity. Used by: Use case: translate data object	F	D
Req-DM-5	A Translator shall be able to view all data objects connected to an information entity. Used by: Use case: translate data object	F	E
Req-DM-6	A Translator shall be able to see what different languages an information entity is to be translated into.	F	D
Req-DM-7	A Translator shall be able to enter a translated data object to its information entity. Used by: Use case: translate data object	F	E
Req-DM-8	NS-FRITS shall be able to automatically translate text into all languages used in the North Sea Region.	F	E
Req-DM-9	NS-FRITS shall be able to generate sound via text to speech	F	D

Table 5-2 Data Modelling and Conversion Requirements.

5.1.3 Analysis

ID	Description	Type	Priority
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Req-AN-1	<p>The system shall be able to find all information entities that are relevant to a user. The following conditions decide if an information entity is relevant or not.</p> <ul style="list-style-type: none"> • The current time must be inside the validity interval of the information entity. • The category of the information entity is among the preferred categories set by the user. • The information entity is located inside the current selection area. <p>Used by: Use case: present information whilst driving, Use case: driver generating a location based warning</p>	F	E
Req-AN-2	<p>The system shall be able to store the following information about each driver:</p> <ul style="list-style-type: none"> • Categories the user is interested in • A prioritized list of languages the user knows <p>Use case: set language preferences Use case: set category preferences</p>	F	E
Req-AN-3	<p>When a user queries the system about information in a certain location, the system shall respond with all information entities whose areas intersect the location. Only information entities belonging to the categories the user has previously set shall be considered.</p> <p>Used by: Use case: present information whilst driving</p>	F	E
Req-AN-4	<p>The system shall log the current position of a driver (i.e. the Vehicle).</p> <p>Information: As this will probably require some kind of message, containing the vehicle position, to be sent from the vehicle to the central system, it will not be possible to know the exact position all the time. The strategy for sending updates will have to balance the need for fast updates and the cost for sending messages (and perhaps limitations of bandwidth).</p> <p>Used by: Use case: present information whilst driving</p>	F	D
Req-AN-5	<p>If a data object is available in different languages, the system shall use the prioritized list of preferred languages for the specific Driver, and use the data object with the language that has the highest priority.</p>	F	E
Req-AN-6	<p>The system shall be able to accept a search for information entities from a user. The search function shall accept three parameters, a geographical point where to search from, an information category and how many nodes there should be in the search result.</p> <p>The search result shall then be put in order depending on the distance to the geographical point specified in the parameter.</p>	F	E
Req-AN-7	<p>Analysis shall take a reasonably small amount of time.</p>	NF	E
Req-AN-8	<p>The system shall be able to accept subscriptions on information entities from users.</p>	F	E

	Description: When an information entity is modified by a data provider, the system shall send out the updated version of the information entity to all clients subscribed to it.		
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Table 5-3 Analysis Requirements.

5.1.4 Distribution

ID	Description	Type	Priority
Req-DB-1	The distribution platform shall be scalable.	NF	E
Req-DB-2	Files attached to information points shall only be distributed upon request.	F	E
Req-DB-3	The system shall keep track of the data distributed to each user to avoid resending already sent information.	F	D
Req-DB-4	Data shall be distributed in a secure way to preserve the integrity of the message.	NF	E
Req-DB-5	Data shall be able to be pushed to the users.	F	E
Req-DB-6	The system shall be serviceable with existing technologies such as GPRS, 3G and WiFi.	F	E

Table 5-4 Distribution Requirements.

5.2 OPERATIONAL DATA / NS FRITS AGREEMENTS

The section will present requirements for NS FRITS Agreements, which is the way NS FRITS will handle operational data.

ID	Description	Type	Priority
Req-AG-1	A driver shall be able to request a new NS FRITS Agreement from a service provider. The driver shall provide a time for the Agreement, and optional ID that connects the NS FRITS agreement to an already existing commercial agreement (e.g. a booking number for a ferry transport). Used by: Use case: user sets up NS FRITS Agreement	F	E
Req-AG-2	A Service provider shall be able to confirm/accept a new NS FRITS Agreement. Used by: Use case: user sets up NS FRITS Agreement	F	D
Req-AG-3	Both parties of NS FRITS Agreements shall be able to set a new estimated time to the agreement. Information: For a driver client, the estimated arrival time can be updated automatically by using the vehicle's current GPS position and a route planning software. Used by: Use case: user signals deviation from NS FRITS Agreement, Use case: service provider signals deviation from NS FRITS Agreement	F	E
Req-AG-4	When one of the parties in an agreement updates the time, the other	F	E

	party should be informed in real time. Use case: user signals deviation from NS FRITS Agreement, Use case: service provider signals deviation from NS FRITS Agreement		
Req-AG-5	Any two parties that have established an NS FRITS Agreement shall be able to send text messages to each other.	F	D

Table 5-5 Agreement Requirements

5.3 CLIENT REFERENCE IMPLEMENTATION

Since the NS FRITS client can be implemented in many different ways, this section presents requirements for a basic reference implementation of NS FRITS. After these requirements have been fulfilled, the implementer is free to extend their implementation with additional functionality. This section will be split up into two different types of requirements, reference client requirements and driver client requirement.

An implementer of a desktop version of NS FRITS must fulfil all requirements mentioned in the Reference Client Requirement list.

An implementer of a driver version of NS FRITS, i.e. an in-vehicle or smart phone version must fulfil all requirements in the Reference Client Requirements list as well as all requirements in the Driver Client Requirement list.

5.3.1 Reference client requirements

ID	Description	Type	Priority
Req-RC-1	The system shall present all relevant information entities as icons on a map. There shall be specific icons for each information type. Use case: search for point of interest	F	E
Req-RC-2	When the user clicks on an icon for an information entity, the information bound to it shall be presented. Use case: search for point of interest	F	E
Req-RC-3	The user shall be able to set their preferred language such that where available/applicable, the system shall thereafter provide information to the user in that language	F	E
Req-RC-4	A user shall be able to specify a personal set of preferred categories. Information: Only information entities with a category belonging to the preferred categories shall be presented to the user. Used by: Use case: set category preferences	F	E
Req-RC-5	A user shall be able to specify a personal prioritized list of preferred languages. Used by: Use case: set language preferences	F	E
Req-RC-6	The user shall be able to define a selection area expressed as a route, so that all relevant information entities along this route could be presented to the user. Used by: Use case: present information for routes or a specific location	F	E
Req-RC-7	The user shall be able to select a relevant data information entity and get access to all data objects attached to it. Used by: Use case: present information whilst driving	F	E
Req-RC-8	The user shall be able to search for all information entities from a specific category.	F	E

	It shall also be possible to define a geographic boundary, so that only information entities inside this boundary will be found. The boundary could either be a circle round a specified location, a specified route, or an administrative area (a country or a region). Use by: Use case: search for point of interest		
Req-RC-9	The user shall be able to enter a route into the system. A route consists of a starting position, an ending position and any number of intermediate positions. Information: The system will use the route as a selection area, to make it possible to search for relevant information entities along a road.	F	E
Req-RC-10	The user shall be able to select a relevant information entity and get access to an NS FRITS Agreement if such is associated with it. Used by: Use case: user sets up NS FRITS Agreement	F	E
Req-RC-11	A user shall be able to subscribe to an information entity. Description: When a user has subscribed to an information entity, it will receive immediate copies of the information entity whenever the information entity is modified or updated by a data provider.	F	D
Req-RC-12	A user shall be able to unsubscribe to an information entity.	F	D
Req-RC-13	The user shall be able to click on an icon to view all data elements attached to an information entity. Use case: search for point of interest	F	E
Req-RC-14	The user shall be able to download a file attached to an information entity.	F	D
Req-RC-15	The user shall be able to open attached PDF documents.	F	D
Req-RC-16	The user shall be able to open attached images files.	F	E
Req-RC-17	The user shall be able to open URL links.	F	D

Table 5-6 Reference Client Requirements.

5.3.2 Driver client requirements

ID	Description	Type	Priority
Req-DR-1	The system shall present the current position of the vehicle on a map. Used by: Use case: present information whilst driving	F	E
Req-DR-2	The system shall present an audio message whenever the driver enters the area of an information entity. Used by: Use case: present information whilst driving	F	E
Req-DR-3	The driver shall be able to demand that the data objects attached to an information entity is presented after an audio message has announced that a new information entity is detected. Information: If a speech recognition system is available in the vehicle, the driver could do this by just saying "more", "details" or something like that. Used by: Use case: present information whilst driving	F	D
Req-DR-4	The content of a fetched information object shall automatically be displayed when a user is inside its area of effect.	F	E

Table 5-7 Driver Client Requirements**5.4 OVERALL SYSTEM REQUIREMENTS**

In this section overall system requirements are listed, meaning general non functional requirement of the system in its entirety. These requirements are not backed up by a particular use case.

ID	Description	Type	Priority
Req-SR-1	The system services shall be accessible from any country of the North Sea Region	NF	E
Req-SR-2	It shall be possible to run the system in a debugging mode, where system actions are either printed on screen or written to a log file.	NF	E
Req-SR-3	The system shall be designed in such a way that it would be easy to extend with new functionality without losing backwards compatibility with existing clients.	NF	E
Req-SR-4	The backend system shall be designed in a way that a client implementation is possible on multiple platforms, e.g. Android, MeeGo, Iphone, Dynafleet, etc.	NF	E
Req-SR-5	It shall be possible to run the system in a logging mode, where statistics about user actions are logged to be able to pinpoint what areas of the system are being used most frequently	NF	D
Req-SR-6	Security and user integrity shall be carefully considered while designing the system.	NF	E
Req-SR-7	The backend system shall be designed in such a way that system maintenance is possible with minimal or no downtime.	NF	D
Req-SR-8	The system platform shall be designed in such a way that it can scale with thousands of users.	NF	E
Req-SR-9	The data in the system shall exist in all languages spoken in the North Sea Region.	NF	E
Req-SR-10	The data in the system shall exist in all languages spoken in Europe.	NF	D

Table 5-8 Overall System Requirements.

6 APPENDIX A: LIST OF FIGURES

Figure 3.1 Illustrates how data from existing(independent) providers are inserted into the NS FRITS database	8
Figure 3.2 Shows the location of this document in context of the entire project	9
Figure 4.1 Show the relationship between Information Entities and Data Objects, the Data Objects contain the actual information in the system.	10
Figure 4.2 Environmental Data and Operational Data	11
Figure 4.3 Shows how Users, Translators and Providers interact with the NS FRITS system. Providers are shown at the left side, Users at the right side and Translators in the middle.	13
Figure 4.4 Overview how the NS FRITS Agreement service is being used for transferring operational data between users and providers.	13
Figure 4.5 Actors and use cases of NS FRITS	14

7 APPENDIX B: LIST OF TABLES

Table 1-1 : Document versions sheet.....	4
Table 2-1 Definitions.....	5
Table 5-1 Data collection requirements.....	24
Table 5-2 Data Modelling and Conversion Requirements.....	24
Table 5-3 Analysis Requirements.....	26
Table 5-4 Distribution Requirements.....	26
Table 5-5 Agreement Requirements.....	27
Table 5-6 Reference Client Requirements.....	28
Table 5-7 Driver Client Requirements.....	29
Table 5-8 Overall System Requirements.....	29

APPENDIX C: LEGAL AND LICENSING ISSUES

Summary of legislation regarding the use of hand held devices in cabs

The use of hand held phone whilst driving is illegal in six out of the seven North Sea Region countries – Belgium, Denmark, Germany, Netherlands, Norway and the UK. Only Sweden has not made it illegal to use hand held phones whilst driving.

The European Commission categorises telematics devices inside vehicles into two types¹:

1. Information displays intended to support driving decisions
2. Vehicle control devices (such as Autonomous Intelligent Cruise Control and Collision Avoidance Systems)

In the Directive of the European Parliament and of the council laying down the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other transport modes, article 3, 2c, it states that the member states shall “take the necessary measures to integrate safety and security related ITS systems into vehicles and road infrastructure and to develop safe human-machine interfaces, in particular for nomadic devices”.

UK Legislation

1. Road Vehicles (Construction and Use) (Amendment) (No_4) Regulations 2003

On the 1st December 2003 this regulation came into force. It states that “no person shall drive a motor vehicle on a road if they are using a hand held mobile telephone or a hand held device of a kind specified in paragraph 4”.

Paragraph 4 states “a device, other than a two way radio, which performs an interactive communication function by transmitting and receiving data”.

It continues to state “a mobile telephone or other device is to be treated as hand held if it is, or must be, held at some point during the course of making or receiving a call or performing any other interactive communication feature”.

“Interactive communication function” is defined as:

- i. “Sending or receiving oral or written messages;
- ii. Sending or receiving facsimile documents;
- iii. Sending or receiving still or moving images; and
- iv. Providing access to the internet;”

Summary of legislation regarding the use of television devices whilst driving

UK legislation² states that:

No person shall drive, or cause or permit to be driven, a motor vehicle on a road, if the driver is in such a position as to be able to see, whether directly or by reflection, a television receiving apparatus or other cinematographic apparatus used to display anything other than information:

- (a) about the state of the vehicle or its equipment;
- (b) about the location of the vehicle and the road on which it is located;
- (c) to assist the driver to see the road adjacent to the vehicle; or
- (d) to assist the driver to reach his destination.

¹ Community strategy and framework for the deployment of road transport telematics in Europe (97) 223 final

² Regulation 109 of the Road Vehicles (Construction and Use) Regulations 1986